NOTES ON THE POLLINATION OF PLUMS.

BY L. H. PAMMEL, AMES, IOWA.

SOME years ago while making a few random examinations of the cultivated DeSoto Plum (*Prunus Americana*, Marshall) I found to my surprise that the flowers were not all perfect, although described as such. Many flowers have since been examined and I have never failed, in some individuals at least, to find this character well pronounced.

In all cases examined the suppression was in the direction of the pistil. The stamens in all cases were well developed. In these imperfect flowers the pistil is short, scarcely as long as the calyx tube. In the Rollingstone the pistil is entirely absent in many cases.

To see how generally the pistils were rudimentary, a number of counts were made on branches selected at random on several trees.

First Tree.

	Perfect.	Imperfect.
First branch,	10	2
Second "	14	4
Third "	17	5
Fourth "	7	2

Second Tree.

	Perfect.	Imperfect.
First branch,	15	2
Second "	10	6

Third Tree.

	Perfect.	Imperfect.
First branch,	0	36
Second "	16	0

These imperfect flowers also occur in the Pottawattamie, but not so commonly as the Rollingstone and DeSoto. I thought at first that these imperfect flowers might be due to the improvement of the variety under cultivation, but on examining some seedlings along an old fence I found that imperfect flowers also occurred. Of the enormous number of perfect flowers produced on a single tree a small percentage only develop into plums. They are undoubtedly in many cases fertilized but for want of nutrition fail to mature.

The flowers of *Prunus Americana*, in absence of cross pollination, are undoubtedly close pollinated. To test the matter of close fertilization, about 150 flowers were covered with paper bags. Of these fifty set. Between twenty-five and thirty flowers were castrated and pollen applied from other flowers of the same plant with the result that one-third set. Considering the circumstances under which they were made it is a fairly good showing.

I was much interested this spring to notice that some forms of *Prunus domestica* (Moldavka Plum) are proterogynous. The pistil in some cases protrudes while the flowers are still more or less closed. In other forms of *Prunus domestica* grown on the college grounds the pistil matures simultaneously with the stamens. This latter condition agrees with Hermann Müller's[1] observations, who says of *Prunus domestica*, *P. avium* and *P. cerasus*, "anthers and stigmas ripen simultaneously and spread apart out of the flower." *Prunus padus*, L, and *P. spinosa*, L, according to the same authority, are proterogynous.

The *Rosaceæ* constitute an interesting order of plants, although many of them show adaptations for cross-pollination, they may, at the same time, in absence of cross-pollination, be self-pollinated, not, however, in all cases. Strawberry growers are only too familiar with the failure that results when only one variety is set out.

This tendency to separation of sexes is well marked in widely separated orders and has been admirably discussed by Darwin,[2] who says: "There is much difficulty in understanding why hermaphrodite plants should ever have been rendered dioecious." "We can, however, see that if a species were subjected to unfavorable conditions from severe competition with other plants, or from any other cause, the production of the male and female elements and the maturation of the ovules by the same individual might prove too great a strain on its powers, and the separation of the sexes would then be highly beneficial." As stated in a previous paragraph, many plum flowers are staminate in function as the fruit never develops. This being the case, it would seem an advantage for the pistil to become abortive and in some cases entirely suppressed. May it not be a step in a direction to prevent self-fertilization, which seems to occur quite commonly in some members of this order, or is it the direct action of climate as Darwin thought to be the case in the strawberry?

[1] "Fertilization of Flowers," English translation, p. 222.

[2] "The Different Forms of Flowers on Plants of the Same Species," p. 278, D. Appleton & Co., New York.

LETTERS TO THE EDITOR.

**** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

Total Heat Received by a Planet.

IT may be as well to call attention to the shortest method of treating what seems to be the principal point at issue in the articles on "Sun-Heat and Orbital Eccentricity" and on "The Mean Distance of the Earth" in recent issues of *Science*.

We have simply for the amount of heat, dh, received by any planet in our system by radiation from the sun, in the infinitesimal time dt, on a definite area, say a square foot, of its vertically exposed surface,

$$dh = \frac{c}{r^2}\, dt,$$

in which c is a constant depending on the absolute radiation of the sun, which we suppose to be always the same.

But we have

$$dt = \frac{r_2\, d\theta}{k\sqrt{p}},$$

in which dt is expressed in terms of the day, $d\theta$ in the usual way, so that $180^\circ = \pi$; k being the Gaussian constant, depending on the mass or absolute attractive force of the sun, and p, the semi-parameter, $= a(1 - e^2)$.

Strictly, we must understand by k the Gaussian constant 0.017202 + multiplied by $\sqrt{1+\mu}$, in which

$$\mu = \frac{mass\ of\ planet}{mass\ of\ sun}.$$

We have then

$$dh = \frac{c}{k\sqrt{p}} d\theta,$$

and for the total heat received by radiation on the definite area in one revolution,

$$\frac{2c\pi}{k} \cdot \frac{1}{\sqrt{p}}.$$

Now the major axis being supposed constant, $\sqrt{p}$ is proportional to the minor axis. If then the eccentricity varies in a planetary orbit, the major axis remaining constant, the quantity of heat received by the planet in one revolution by radiation from the sun is inversely as the minor axis, if the size and mass of the planet and the mass and absolute radiation of the sun remain unchanged.

REV. GEO. M. SEARLE.
Catholic University, Washington, D.C.

A Peculiar Occurrence of Beeswax.

AMONG the heterogenous collections of materials that are continually arriving at the National Museum for the purpose of identification, there were received some weeks ago, from Portland, Oregon, samples of a material closely resembling, if not identical with beeswax. Such it would have unhesitatingly been pronounced but for certain stated conditions relating to its mode of occurrence.

The material as received is in the form of (1) nodular, somewhat rounded masses, the largest perhaps the size of a goose egg; (2) in elongated cylindrical forms sometimes incompletely perforated, longitudinally, and (3) as rounded grains forming one of the constituents of a loosely coherent, silicious sandstone. The material is of a grayish color on the outer surface, indicating oxidation, but interiorly it has all the characteristics of genuine beeswax, both as regards physical conditions, color, smell, fusing point, and conduct towards chemical reagents.

In the letter accompanying, the wax is said to be found in masses of all sizes up to 250 pounds weight; that it occurs imbedded in the sand, being found while digging clams at low tide, and at a depth of 20 feet below the surface when digging wells. The material has been traced for a distance of 30 miles up the river.

Tradition has it that many hundred years ago a foreign vessel, (some say a Chinese junk) laden with wax, was wrecked off this coast. This at first thought seems plausible, but aside from the difficulty of accounting for the presence in these waters and at that date, of a vessel loaded with wax, it seems scarcely credible that the material could have been brought, in a single cargo, in such quantities, nor buried so deeply over so large an area. In a fragment of the sandstone above alluded to, the wax occurs in disseminated grains less than half the size of a pin's head and in such abundance that when ignited the stone falls away to a loose gray silicious sand. My correspondent states that the material has been mined by the whites for ever 20 years, but not to any great extent excepting the last 8 or 10 years, during which time many hundred tons have been shipped to San Francisco and Portland, and sold at the rate of 18 cents per pound.

Concerning the accuracy of the account as above given the present writer knows nothing. It is here given in the hope of gaining more information on the subject.

GEORGE P. MERRILL.

U. S. National Museum, Washington, D.C., June 9.

Books for Children.

WILL some specialists in natural history recommend some really satisfactory cheap books suitable for the guidance of children, ten years of age, in their rambles through the fields and woods? Most of the cheap books that I have seen do not give the necessary details for identifying specimens, and yet the naming of what is seen or collected is necessary for arousing enthusiasm in studying the forms of life. Some of the topics which I am inquiring about are as follows:—

The naming of free birds from their size, plumage, song, and habits; and the place and manner of constructing nests and habits of nesting. The naming of trees and shrubs from their bark and leaves. The naming of weeds and flowers found growing wild in the east-central part of the United States. The naming of land-snails, beetles, butterflies, and moths, and their habits.

Perhaps the Agassiz associations have made out lists of the specimens to be found in the various regions of the United States. If this has been done, I have not happened to see any notice of it.

In this connection, I wish to mention the work done by my own teacher in a suburban school at Cincinnati more than twenty years ago. The superintendent of the school, Mr. A. G. Weatherby, afterwards a professor in the Cincinnati University, was an indefatigable collector in various departments of natural history, and his enthusiasm was communicated to his pupils so strongly that there was hardly a boy in his school-room who had not a collection of local moths, land-snail shells, and fresh-water clam-shells. We had them all properly prepared and Mr. Weatherby named them for us; but we learned the localities in which different species were to be found through the broad experience of our teacher, and not from books. In fact, although many of our class of boys had almost complete sets of local snail-shells, and all named, yet I doubt if any of us ever looked into a work on conchology. I do not know whether any of Mr. Weatherby's early pupils have since become professional naturalists, as a result of his teachings, but I do know that the collecting excursions made under his direction were most beneficial as a means of sharpening our powers of observation, and added immensely to the happiness of boyhood.

I am sure that many readers of *Science* will be glad to get information such as I have asked for, as very few parents are able to help their children in classifying and naming the "finds" that they are continually bringing in from the fields.

FRANK WALDO.

Princeton, N.J., June 5.

Worms in the Brain of a Bird.

IN your issue of June 2 is a communication "Relative to Worms in the Brain of a Bird."

Your correspondent will find, by consulting "Fresh-Water Shell Mounds of the St. John's River, Florida," by Professor Jeffries Wyman, page 7, foot-note, an account of a parasitical worm commonly found in the brain of the "snake bird," or water turkey.

CLARENCE B. MOORE.

Philadelphia, June 6.

Note on a Supposed New Endogenous Tree from the Carboniferous.

IN the May number of the *American Geologist* (Vol. XI., 1893, pp. 285, 286, Pl. VI.) I find a short paper by Mr. H. Herzer on "A New Tree from the Carboniferous Rocks of Monroe County, Ohio," in which he describes, under the name of *Winchellina fascina*, a new genus and species. The discovery of a new genus of plants in the Carboniferous, a formation of which the flora is now so very well known, is of itself of considerable interest, but when we learn that it was an endogenous tree the interest deepens, and the discovery, if true, would be the most important addition to our knowledge of the ancestors of this great group of plants that has been made in many years.

The Carboniferous has been called the age of ferns, from the great abundance and high state of development enjoyed by this class of plants in this part of the Paleozoic system. Several supposed endogens have been reported from the Paleozoic, but they have sooner or later been shown to belong to other vegetable classes, and at the present time there is not a single form accepted by paleobotanists as belonging to this age. In fact it is not until well up into the Mesozoic that undoubted endogens made their appearance. This is, of course, negative evidence, but it is so strong that it requires the most positive and convincing evidence to prove their earlier ancestry.

The literature relating to the internal structure of plants of the Paleozoic is now very extensive, and from a careful study of this it appears almost beyond question that the supposed new endogenous tree is a fern-stem of a well-known type. I have not seen the original trunk or sections cut from it, but, judging from the somewhat imperfect description and figures, it is impossible to see any differences of importance between *Winchellina fascina* and *Psaronius cottæ* corda[1] from the Permian of Saxony. It also approaches very closely to *Tubiculites* (*Psaronius*) *relaxato-maximus*[2] Grand'Eury, a fern-stem from the Carboniferous of central France. The cell-bundles described by Mr. Herzer are quite unlike those of any monocotyledon with which I am familiar, but agree well with those described for fern-stems from the older rocks. The reference of this plant to the ferns is also quite in accord with facts that have long been known, for Dr. Newberry recorded the genus *Psaronius* as occurring "in great abundance" in the Carboniferous rocks of Ohio more than forty years ago.[3]

The genus *Psaronius* is a somewhat comprehensive one, and a number of more or less satisfactory genera have recently been separated out of it by Williamson, Renault, Zeiller and others, and it is possible that when the fossil under discussion is more

[1] Stenzel, Ueber die Staarsteine, Jena 1854, p. 867, Pl. xxxv., Fig. 1.

[2] Flore Carbonifère du Dépt. de la Loire. Mem. l'Acad. d. Sci., xxiv., 1877, p. 102, Pl. x., Figs. 3, 4.

[3] Annals of Science, No. 8, Feb. 1, 1853, p. 97.